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Apprenticeship and Industry Training

Carpenter

Apprenticeship Course Outline

0215 (2015)

Alberta

Apprenticeship and Industry Training

INNOVATION AND ADVANCED EDUCATION CATALOGUING IN PUBLICATION DATA

Apprenticeship and Industry Training: Carpenter Apprenticeship Course Outline

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Carpenter
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Apprenticeship

Apprenticeship is post-secondary education with a difference. Apprenticeship begins with finding an employer. Employers hire apprentices, pay their wages and provide on-the-job training and work experience. Approximately 80 per cent of an apprentice's time is spent on the job under the supervision of a certified journeyperson or qualified tradesperson. The other 20 per cent involves technical training provided at, or through, a post-secondary institution – usually a college or technical institute.

To become certified journeypersons, apprentices must learn theory and skills, and they must pass examinations. Requirements for certification—including the content and delivery of technical training—are developed and updated by the Alberta Apprenticeship and Industry Training Board on the recommendation of the Carpenter Provincial Apprenticeship Committee.

The graduate of the Carpenter apprenticeship program is a certified journeyperson who will be able to:

- responsibly do all work tasks expected of a journeyperson
- supervise, train and coach apprentices
- understand the principles of sound and safe construction
- know the characteristics and proper use of all building construction materials
- read drawings, do layout work and calculate quantities of materials
- build various types of concrete forms
- build all types of wood framed buildings and apply exterior and interior finish components
- be proficient in the safe use and maintenance of hand and power tools
- be familiar with the work of other tradespeople in the building industry
- comply with all safety regulations of the construction industry
- perform assigned tasks in accordance with quality and production standards required by industry

Apprenticeship and Industry Training System

Industry-Driven

Alberta's apprenticeship and industry training system is an industry-driven system that ensures a highly skilled, internationally competitive workforce in more than 50 designated trades and occupations. This workforce supports the economic progress of Alberta and its competitive role in the global market. Industry (employers and employees) establishes training and certification standards and provides direction to the system through an industry committee network and the Alberta Apprenticeship and Industry Training Board. The Alberta government provides the legislative framework and administrative support for the apprenticeship and industry training system.

Alberta Apprenticeship and Industry Training Board

The Alberta Apprenticeship and Industry Training Board provides a leadership role in developing Alberta's highly skilled and trained workforce. The board's primary responsibility is to establish the standards and requirements for training and certification in programs under the Apprenticeship and Industry Training Act. The board also provides advice to the Minister of Advanced Education on the needs of Alberta's labour market for skilled and trained workers, and the designation of trades and occupations.

The thirteen-member board consists of a chair, eight members representing trades and four members representing other industries. There are equal numbers of employer and employee representatives.

Industry Committee Network

Alberta's apprenticeship and industry training system relies on a network of industry committees, including local and provincial apprenticeship committees in the designated trades, and occupational committees in the designated occupations. The network also includes other committees such as provisional committees that are established before the designation of a new trade or occupation comes into effect. All trade committees are composed of equal numbers of employer and employee representatives. The industry committee network is the foundation of Alberta's apprenticeship and industry training system.

Local Apprenticeship Committees (LAC)

Wherever there is activity in a trade, the board can set up a local apprenticeship committee. The board appoints equal numbers of employee and employer representatives for terms of up to three years. The committee appoints a member as presiding officer. Local apprenticeship committees:

- monitor apprenticeship programs and the progress of apprentices in their trade, at the local level
- make recommendations to their trade's provincial apprenticeship committee (PAC) about apprenticeship and certification in their trade
- promote apprenticeship programs and training and the pursuit of careers in their trade
- make recommendations to the board about the appointment of members to their trade's PAC
- help settle certain kinds of disagreements between apprentices and their employers
- carry out functions assigned by their trade's PAC or the board

Provincial Apprenticeship Committees (PAC)

The board establishes a provincial apprenticeship committee for each trade. It appoints an equal number of employer and employee representatives, and, on the PAC's recommendation, a presiding officer - each for a maximum of two terms of up to three years. Most PACs have nine members but can have as many as twenty-one. Provincial apprenticeship committees:

- make recommendations to the board about:
    - standards and requirements for training and certification in their trade
    - course outlines and examinations in their trade
    - apprenticeship and certification
    - designation of trades and occupations
    - regulations and orders under the Apprenticeship and Industry Training Act
- monitor the activities of local apprenticeship committees in their trade
- determine whether training of various kinds is equivalent to training provided in an apprenticeship program in their trade
- promote apprenticeship programs and training and the pursuit of careers in their trade
- consult with other committees under the Apprenticeship and Industry Training Act about apprenticeship programs, training and certification and facilitate cooperation between different trades and occupations
- consult with organizations, associations and people who have an interest in their trade and with employers and employees in their trade
- may participate in resolving certain disagreements between employers and employees
- carry out functions assigned by the board

Carpenter PAC Members at the Time of Publication

Mr. M. Jantz	Sexsmith	Presiding Officer
Mr. K. Gloer	Calgary	Employer
Mr. D. Mathews	Lethbridge	Employer
Mr. B. Armstrong	Red Deer	Employee
Mr. C.Chapman	Lethbridge	Employee
Mr. C. Ertman	Leduc	Employee
Ms. C. Plaxton	Grande Prairie	Employee

Alberta Government

Alberta Advanced Education works with industry, employer and employee organizations and technical training providers to:

- facilitate industry's development and maintenance of training and certification standards
- provide registration and counselling services to apprentices and employers
- coordinate technical training in collaboration with training providers
- certify apprentices and others who meet industry standards

Apprenticeship Safety

Safe working procedures and conditions, incident/injury prevention, and the preservation of health are of primary importance in apprenticeship programs in Alberta. These responsibilities are shared and require the joint efforts of government, employers, employees, apprentices and the public. Therefore, it is imperative that all parties are aware of circumstances that may lead to injury or harm.

Safe learning experiences and healthy environments can be created by controlling the variables and behaviours that may contribute to or cause an incident or injury. By practicing a safe and healthy attitude, everyone can enjoy the benefit of an incident and injury free environment.

Alberta Apprenticeship and Industry Training Board Safety Policy

The Alberta Apprenticeship and Industry Training Board (board) fully supports safe learning and working environments and emphasizes the importance of safety awareness and education throughout apprenticeship training in both on-the- job training and technical training. The board also recognizes that safety awareness and education begins on the first day of on-the-job training and thereby is the initial and ongoing responsibility of the employer and the apprentice as required under workplace health and safety training. However the board encourages that safe workplace behaviour is modeled not only during on-the-job training but also during all aspects of technical training, in particular, shop or lab instruction. Therefore the board recognizes that safety awareness and training in apprenticeship technical training reinforces, but does not replace, employer safety training that is required under workplace health and safety legislation.

The board has established a policy with respect to safety awareness and training:

> **The board promotes and supports safe workplaces, which embody a culture of safety for all apprentices, employers and employees. Employer required safety training is the responsibility of the employer and the apprentice, as required under legislation other than the *Apprenticeship and Industry Training Act*.**

The board's complete document on its 'Apprenticeship Safety Training Policy' is available at www.tradesecrets.alberta.ca; access the website and conduct a search for 'safety training policy'.

Implementation of the policy includes three common safety learning outcomes and objectives for all trade course outlines. These common learning outcomes ensure that each course outline utilizes common language consistent with workplace health and safety terminology. Under the title of 'Standard Workplace Safety', this first section of each trade course outline enables the delivery of generic safety training; technical training providers will provide trade specific examples related to the content delivery of course outline safety training.

Occupational Health and Safety

A tradesperson is often exposed to more hazards than any other person in the work force and therefore should be familiar with and apply the Occupational Health and Safety Act, Regulations and Code when dealing with personal safety and the special safety rules that apply to all daily tasks.

Occupational Health and Safety (a division of Alberta Human Services) conducts periodic inspections of workplaces to ensure that safety regulations for industry are being observed.

Additional information is available at www.humanservicesalberta.ca

Technical Training

The technical institutes and colleges are key participants in Alberta's apprenticeship and industry training system. They work with the board, industry committees and Alberta Advanced Education to enhance access and responsiveness to industry needs through the delivery of the technical training component of apprenticeship programs. They develop lesson plans from the course outlines established by industry and provide technical training to apprentices.

The colleges and institutes are committed to delivering the technical training component of Alberta apprenticeship programs in a safe, efficient and effective manner. All training providers place great emphasis on safe technical practices that complement safe workplace practices and help to develop a skilled, safe workforce.

The following institutions deliver Carpenter apprenticeship technical training:

- Keyano College
- Lethbridge College
- Grande Prairie Regional College
- Red Deer College
- Olds College
- Portage College
- Lakeland College
- Medicine Hat College
- Northern Alberta Institute of Technology
- Southern Alberta Institute of Technology
- Northern Lakes College

Procedures for Recommending Revisions to the Course Outline

Advanced Education has prepared this course outline in partnership with the Carpenter Provincial Apprenticeship Committee.

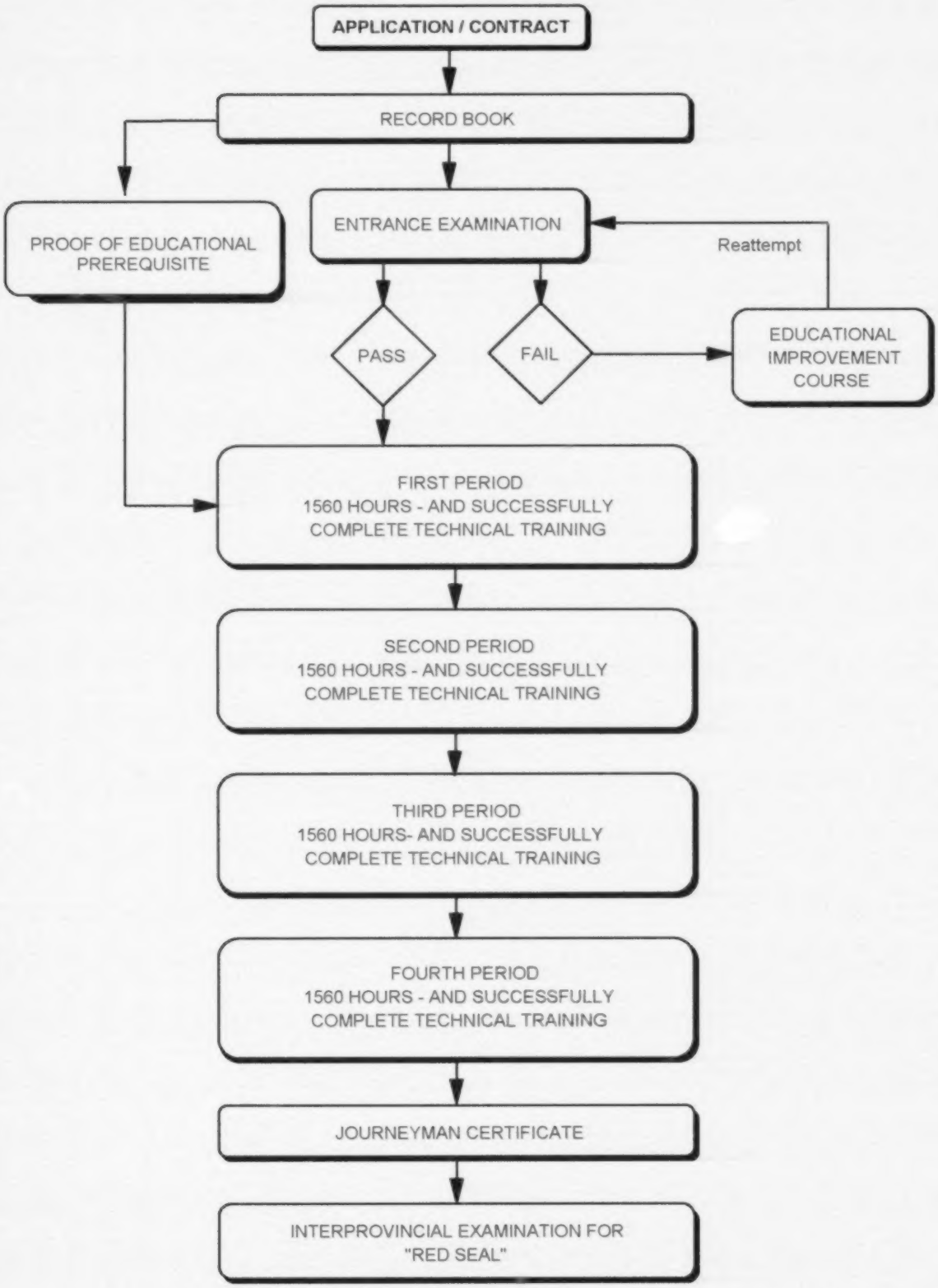
This course outline was approved on December 12, 2014 by the Alberta Apprenticeship and Industry Training Board on a recommendation from the Provincial Apprenticeship Committee. The valuable input provided by representatives of industry and the institutions that provide the technical training is acknowledged.

Any concerned individual or group in the province of Alberta may make recommendations for change by writing to:

Carpenter Provincial Apprenticeship Committee
c/o Industry Programs and Standards
Apprenticeship and Industry Training
Advanced Education
10th floor, Commerce Place
10155 102 Street NW
Edmonton AB T5J 4L5

It is requested that recommendations for change refer to specific areas and state references used. Recommendations for change will be placed on the agenda for regular meetings of the Carpenter Provincial Apprenticeship Committee.

Apprenticeship Route toward Certification



Carpenter Training Profile
First Period
(8 Weeks 30 Hours per Week – Total of 240 Hours)

SECTION ONE

SAFETY AND BUILDING MATERIALS
26 HOURS

A	B	C
Safety Legislation, Regulations and Industry Policy in the Trades – 4 Hours	Climbing, Lifting, Rigging and Hoisting – 4 Hours	Hazardous Materials and Fire Protection – 2 Hours
D	**E**	**F**
Construction Equipment Safety – 3 Hours	Apprenticeship Training Program Orientation – 2 Hours	Solid Wood Products and Wood Joinery – 3 Hours
G	**H**	**I**
Manufactured Construction Products – 3 Hours	Fasteners, Adhesives and Sealants – 3 Hours	Introduction to Concrete – 2 Hours

SECTION TWO

TOOLS
78 HOURS

A	B	C
Hand Tools – 30 Hours	Portable Power Tools – 18 Hours	Stationary Power Tools – 19 Hours
D	**E**	**F**
Cutters, Bits and Abrasives – 4 Hours	Explosive Actuated Tools – 5 Hours	Pneumatic and Fuel Powered Tools – 2 Hours

SECTION THREE

SITE PREPERATION, BUILDING LAYOUT, FOUNDATIONS AND FLOOR FRAME SYSTEMS
74 HOURS

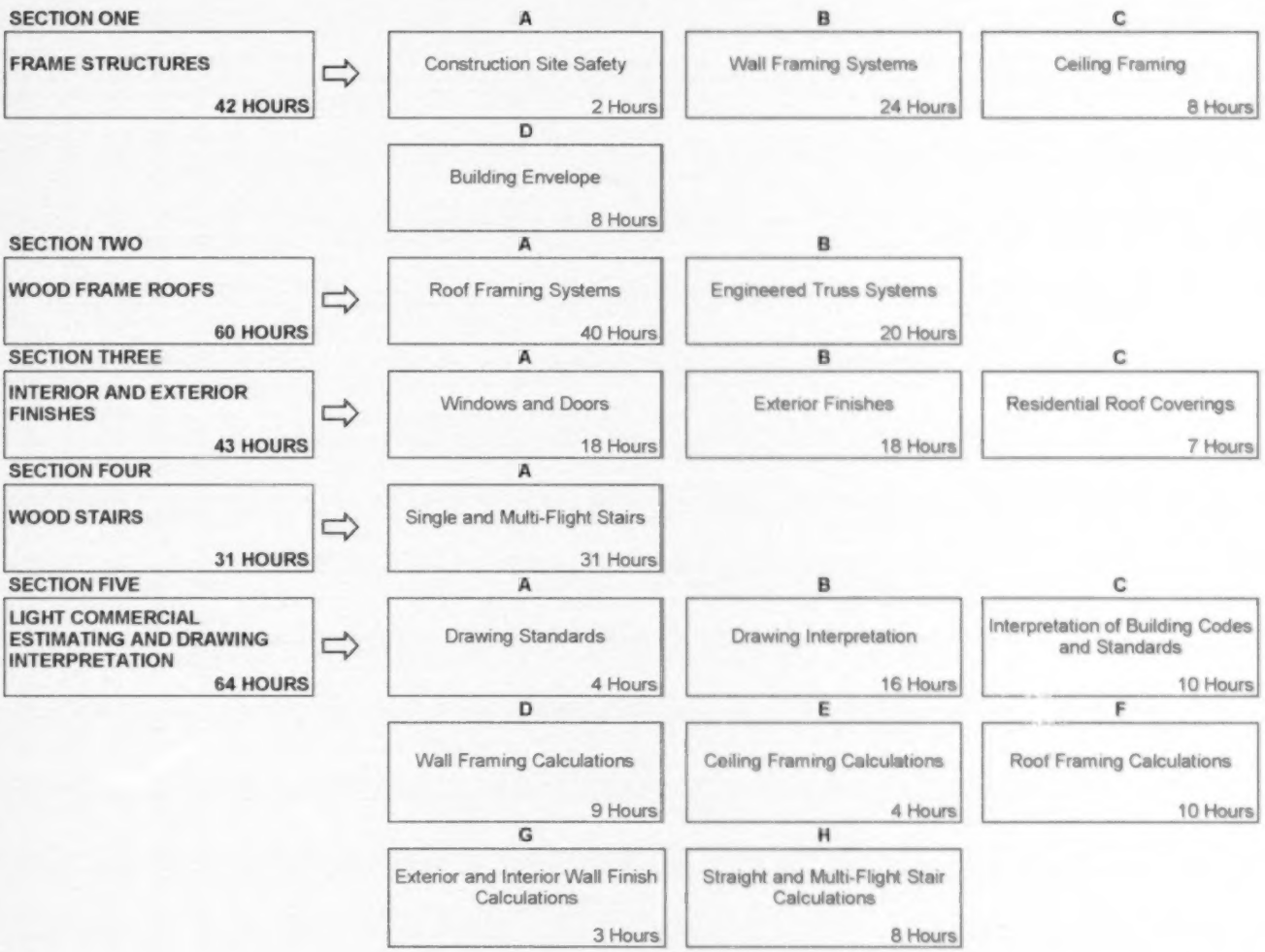
A	B	C
Preliminary Building Procedures – 6 Hours	Building Loads and Forces – 2 Hours	Foundation Supports – 12 Hours
D	**E**	**F**
Concrete Flatwork – 4 Hours	Foundation Systems – 32 Hours	Floor Frame Support – 9 Hours
G		
Floor Frames – 9 Hours		

SECTION FOUR

RESIDENTIAL ESTIMATING AND DRAWING INTEPRETATION
62 HOURS

A	B	C
Drawing Basics – 2 Hours	Orthographic Drawings – 4 Hours	Pictorial Drawings and Sketching – 4 Hours
D	**E**	**F**
Drawing Standards – 6 Hours	Drawing Interpretation Principles – 16 Hours	Math Concepts – 18 Hours
G	**H**	
Estimate Foundation Forms and Concrete Material Requirements – 6 Hours	Estimate Floor Systems Material Requirements – 6 Hours	

Second Period
(8 Weeks 30 Hours per Week – Total of 240 Hours)



Third Period
(8 Weeks 30 Hours per Week – Total of 240 Hours)

SECTION ONE

CONCRETE AND BUILDING LAYOUT
42 HOURS

A	B	C
Commercial and Industrial Construction Site Safety 4 Hours	Scaffolding 9 Hours	Concrete Mix Design 3 Hours
D	**E**	**F**
Transporting and Placement of Concrete 2 Hours	Finishing and Curing of Concrete 3 Hours	Joints and Reinforcement for Concrete 2 Hours
G	**H**	
Pre-Stressed and Precast Concrete 1 Hour	Survey Equipment 18 Hours	

SECTION TWO

COMMERCIAL FORM WORK
64 HOURS

A	B	C
Piles, Footings & Grade Beams 4 Hours	Wall and Column Forming 20 Hours	Suspended Concrete Slabs 20 Hours
D		
Concrete Stairs 20 Hours		

SECTION THREE

COMMERCIAL INTERIORS AND EXTERIORS
64 HOURS

A	B	C
Interior Systems and Door Frames 10 Hours	Commercial Doors and Windows 10 Hours	Commercial Exteriors 4 Hours
D	**E**	**F**
Commercial Roofs 2 Hours	Fire Protection, Acoustics and Commercial Insulation 4 Hours	Commercial Fasteners and Anchors 2 Hours
G	**H**	
Timber Construction 2 Hours	Commercial Interior Millwork 30 Hours	

SECTION FOUR

COMMERCIAL ESTIMATING AND DRAWING INTERPRETATION
70 HOURS

A	B	C
Drawing Standards 4 Hours	Commercial Drawing Interpretation 24 Hours	Commercial Concrete Structures Material Takeoffs 10 Hours
D	**E**	**F**
Commercial Concrete Volume Calculations 8 Hours	Cut and Fill Calculations 8 Hours	Concrete Stair Calculations 8 Hours
G		
Interior Systems Calculations 8 Hours		

Fourth Period
(8 Weeks 30 Hours per Week – Total of 240 Hours)

SECTION ONE

WORKPLACE ORGANIZATION AND INTERIOR FINISHES
69 HOURS

A	B	C
Industrial Construction Site Safety 3 Hours	Alberta's Industry Network 2 Hours	Workplace Coaching Skills 2 Hours
D	**E**	**F**
Interprovincial Standards Red Seal Program 1 Hour	Job Scheduling 4 Hours	Construction Materials Management 4 Hours
G	**H**	**I**
Cabinet Installation 4 Hours	Trim Installation 4 Hours	Walls and Storage 2 Hours
J	**K**	**L**
Wood Finishing 2 Hours	Flooring 2 Hours	Interior Finish Carpentry Project 39 Hours

SECTION TWO

ADVANCED ROOF FRAMING AND STAIRS
75 HOURS

A	B	C
Advanced Roof Framing 20 Hours	Housed Stairs 15 Hours	Winder Stairs 20 Hours
D		
Curved Stairs 20 Hours		

SECTION THREE

RENOVATIONS, BUILDING DESIGN, ENERGY EFFICIENCY AND BUILDING SCIENCE
42 HOURS

A	B	C
Renovations 4 Hours	Additions 2 Hours	Architectural Building Design Concepts 2 Hours
D	**E**	**F**
Barrier-Free Design and Ergonomics 4 Hours	Energy Efficient Construction 6 Hours	Energy Efficient Building Design 6 Hours
G	**H**	
Energy Efficient Framing 6 Hours	Insulation and Air Barriers 12 Hours	

SECTION FOUR

INDUSTRIAL ESTIMATING AND DRAWING INTERPRETATION
54 HOURS

A	B	C
Industrial Trade Math 6 Hours	Interior Finish Calculations 4 Hours	Industrial Project Costing 3 Hours
D	**E**	**F**
Roof Calculations 6 Hours	Advanced Stair Calculations 5 Hours	Industrial Drawing Interpretation 30 Hours

NOTE: The hours stated are for guidance and should be adhered to as closely as possible. However, adjustments must be made for rate of apprentice learning, statutory holidays, registration and examinations for the training establishment and Apprenticeship and Industry Training.

FIRST PERIOD TECHNICAL TRAINING
CARPENTER TRADE
COURSE OUTLINE

UPON SUCCESSFUL COMPLETION OF THIS PROGRAM THE APPRENTICE SHOULD BE ABLE TO PERFORM THE FOLLOWING OUTCOMES AND OBJECTIVES.

SECTION ONE: ..... SAFETY AND BUILDING MATERIALS ..... 26 HOURS

A. Safety Legislation, Regulations & Industry Policy in the Trades ..... 4 Hours

Outcome: ***Describe legislation, regulations and practices intended to ensure a safe work place in this trade.***

1. Demonstrate the ability to apply the Occupational Health and Safety Act, Regulation and Code.
2. Explain the role of the employer and employee in regard to Occupational Health and Safety (OH&S) regulations, Worksite Hazardous Materials Information Systems (WHMIS), fire regulations, Workers Compensation Board regulations, and related advisory bodies and agencies.
3. Explain industry practices for hazard assessment and control procedures.
4. Describe the responsibilities of workers and employers to apply emergency procedures.
5. Describe positive tradesperson attitudes with respect to housekeeping, personal protective equipment and emergency procedures.
6. Describe the roles and responsibilities of employers and employees with respect to the selection and use of personal protective equipment (PPE).
7. Select, use and maintain appropriate PPE for worksite applications.

B. Climbing, Lifting, Rigging and Hoisting ..... 4 Hours

Outcome: ***Describe the use of personal protective equipment (PPE) and safe practices for climbing, lifting, rigging and hoisting in this trade.***

1. Select, use and maintain specialized PPE for climbing, lifting and load moving equipment.
2. Describe manual lifting procedures using correct body mechanics.
3. Describe rigging hardware and the safety factor associated with each item.
4. Select the correct equipment for rigging typical loads.
5. Describe hoisting and load moving procedures.

C. Hazardous Materials & Fire Protection ..... 2 Hours

Outcome: ***Describe the safety practices for hazardous materials and fire protection in this trade.***

1. Describe the roles, responsibilities features and practices related to the Workplace Hazardous Materials Information System (WHMIS) program.
2. Describe the three key elements of WHMIS.
3. Describe handling, storing and transporting procedures when dealing with hazardous material.
4. Describe safe venting procedures when working with hazardous materials.
5. Describe fire hazards, classes, procedures and equipment related to fire protection.

D. Construction Equipment Safety ..... 3 Hours

Outcome: Apply safe work practices with construction equipment.

1. Identify construction equipment.
2. Use safe work practices when working with construction equipment.

E. Apprenticeship Training Program Orientation ..... 2 Hours

Outcome: Describe the process for managing an apprenticeship to journeyman certification.

1. Describe the contractual responsibilities of the apprentice, employer and Alberta Apprenticeship and Industry Training.
2. Describe the purpose of the record book.
3. Describe the procedure for changing employers during apprenticeship.
4. Describe the purpose of the course outline.
5. Describe the procedure for advancing through apprenticeship.
6. Describe employment opportunities in this trade.

F. Solid Wood Products and Wood Joinery ..... 3 Hours

Outcome: Use solid wood products and joinery.

1. Describe types and characteristics of solid wood products.
2. Describe how lumber is milled, seasoned, stored and ordered.
3. Describe the application of solid wood mouldings.
4. Describe wood joining methods for fabrication and installation.

G. Manufactured Construction Products ..... 3 Hours

Outcome: Use manufactured construction products.

1. Describe the application of panel products.
2. Describe the application of engineered wood products.
3. Describe the application of synthetic and metal products.

H. Fasteners, Adhesives and Sealants ..... 3 Hours

Outcome: Apply fasteners, adhesives and sealants.

1. Identify types and functions of fasteners.
2. Identify types and functions of adhesives.
3. Identify types and functions of sealants.

I. Introduction to Concrete ..... 2 Hours

Outcome: Describe the ingredients, production, placing and curing of concrete.

1. Identify the ingredients and production of concrete.
2. Describe the placement and curing of concrete.

SECTION TWO: ..... TOOLS ..... 78 HOURS

A. Hand Tools ..... 30 Hours

Outcome: Use hand tools.

1. Identify hand tools.
2. Describe the uses of hand tools.
3. Use hand tools.

B. Portable Power Tools ..... 18 Hours

Outcome: Use portable power tools.

1. Identify portable power tools.
2. Describe the uses of portable power tools.
3. Use portable power tools.

C. Stationary Power Tools ..... 19 Hours

Outcome: Use stationary power tools.

1. Identify stationary power tools.
2. Describe the uses of stationary power tools.
3. Maintain stationary power tools.
4. Use stationary power tools.

D. Cutters, Bits and Abrasives ..... 4 Hours

Outcome: Maintain tools and accessories.

1. Describe the equipment used to maintain chisels, plane irons and scrapers.
2. Describe the types and uses of sanding abrasives.
3. Describe the types, uses and maintenance of saw blades.
4. Describe the types, uses and maintenance of drill bits and router bits.

E. Explosive Actuated Tools ..... 5 Hours

Outcome: Use explosive actuated tools.

1. Identify explosive actuated tools.
2. Describe the uses of explosive actuated tools.
3. Maintain explosive actuated tools.
4. Use explosive actuated tools.

F. Pneumatic and Fuel Powered Tools ..... 2 Hours

Outcome: Use pneumatic and fuel-powered tools.

1. Identify pneumatic and fuel powered tools.
2. Describe the uses of pneumatic and fuel-powered tools.
3. Describe the maintenance of pneumatic and fuel powered tools.
4. Use pneumatic and fuel powered tools.

SECTION THREE: ..... SITE PREPARATION, BUILDING LAYOUT, FOUNDATIONS AND FLOOR FRAME SYSTEMS ..... 74 HOURS

A. Preliminary Building Procedures ..... 6 Hours

Outcome: Follow preliminary site and building layout procedures in preparation for footing placement.

1. Describe initial on-site procedures.
2. Describe building layout procedures.
3. Describe the use of levelling equipment.
4. Describe excavation and shoring procedures.

B. Building Loads and Forces ..... 2 Hours

Outcome: Use construction design principles to counteract the forces that act upon buildings and structures.

1. Identify the loads and forces that act upon a building.
2. Describe construction design principles used to counteract loads and forces.

C. Foundation Supports ..... 12 Hours

Outcome: Construct footings.

1. Describe types of footings.
2. Describe layout and construction of footings.
3. Describe types of piles and their construction.
4. Construct a footing.

D. Concrete Flatwork ..... 4 Hours

Outcome: Construct concrete flatwork.

1. Describe sub grade preparation, forming methods, reinforcement, and placing requirements for concrete flatwork.
2. Construct concrete flatwork.

E. Foundation Systems ..... 32 Hours

Outcome: Construct foundation systems.

1. Describe the components and erection processes for modular foundation form systems.
2. Describe steel reinforcement, concrete placement and form removal for concrete foundations.
3. Describe permanent wood foundation systems.
4. Describe insulated concrete systems.
5. Describe alternative foundation system types.
6. Describe moisture protection and backfill requirements for foundation systems.
7. Construct a foundation system.

F. **Floor Frame Support** ..... **9 Hours**

Outcome: ***Install floor frame supports.***

1. Identify beam support types.
2. Describe the design and construction of beams.
3. Describe methods used to anchor the floor frame to the foundation.

G. **Floor Frames** ..... **9 Hours**

Outcome: ***Construct a floor frame.***

1. Identify the components of a floor frame.
2. Describe the layout and installation procedures for a floor frame.
3. Construct a floor frame system.

SECTION FOUR: ..... RESIDENTIAL ESTIMATING AND DRAWING INTERPRETATION ..... 62 HOURS

A. **Drawing Basics** ..... **2 Hours**

Outcome: ***Use drawing instruments.***

1. Describe the functions of drawing instruments.
2. Complete geometric shape exercises using drawing instruments.
3. Describe the applications of geometry in trade situations.
4. Draw objects incorporating shapes and angles.

B. **Orthographic Drawings** ..... **4 Hours**

Outcome: ***Draw orthographic projections of objects.***

1. Describe the concept and principles of orthographic projection.
2. Draw orthographic projections of objects.

C. **Pictorial Drawings and Sketching** ..... **4 Hours**

Outcome: ***Use sketching and pictorial drawing techniques to produce isometric drawings.***

1. Describe sketching and pictorial drawing methods.
2. Use isometric drawing techniques.
3. Produce isometric drawings.

D. **Drawing Standards** ..... **6 Hours**

Outcome: ***Create orthographic views, section views, detail views and a cutting list for a shop project.***

1. Identify drawing conventions for orthographic and section views and details.
2. Describe the requirements for a cutting list.
3. Produce the drawings and cutting list for a shop project.
4. Sketch detail views required for a shop project.

E. **Drawing Interpretation Principles** ..... **16 Hours**

Outcome: ***Interpret a set of working drawings and construction documentation.***

1. Identify the paper language conventions used on working drawings.
2. Describe architectural, structural, mechanical, electrical and shop drawings.
3. Identify the different views found on a set of working drawings.
4. Describe specifications, discrepancies and path in a set of working drawings.
5. Interpret working drawings.

F. **Math Concepts** ..... **18 Hours**

Outcome: ***Apply math concepts to solve problems using both the metric and imperial systems of measurement.***

1. Describe math equations and order of operations.
2. Describe calculator functions and operations.
3. Describe the metric and imperial measurement systems.
4. Perform calculations involving fractions.
5. Convert measurements between metric and imperial systems.
6. Perform calculations using the Pythagorean Theorem.
7. Determine the perimeter and centerline perimeter for various shapes and buildings.
8. Determine the area and volume for various shapes and objects.
9. Perform ratio and proportion calculations.
10. Perform percentage calculations.

G. **Estimate Foundation Forms and Concrete Material Requirements** ..... **6 Hours**

Outcome: ***Calculate the quantity of forming material and concrete required for concrete foundations.***

1. Describe the difference between a material takeoff and an estimate.
2. Estimate material requirements for forming strip footings, pad footings and foundation walls.
3. Estimate concrete volume requirements for footings, pilings and foundation walls.
4. Estimate concrete volume requirements for floor areas.

H. **Estimate Floor Systems Material Requirements** ..... **6 Hours**

Outcome: ***Calculate the quantity of framing materials required for conventionally framed floor and floor support systems.***

1. Calculate material takeoffs for floor support systems.
2. Calculate material takeoffs for floor frames.
3. Calculate material takeoffs for sub-floor coverings.

SECOND PERIOD TECHNICAL TRAINING
CARPENTER TRADE
COURSE OUTLINE

UPON SUCCESSFUL COMPLETION OF THIS PROGRAM THE APPRENTICE SHOULD BE ABLE TO PERFORM THE FOLLOWING OUTCOMES AND OBJECTIVES.

SECTION ONE: ..... FRAME STRUCTURES ..... 42 HOURS

A. Construction Site Safety ..... 2 Hours

Outcome: Apply safety procedures on construction work sites.

1. Describe fall prevention systems and personal protective equipment used on construction work sites.

B. Wall Framing Systems ..... 24 Hours

Outcome: Construct wall framing systems for wood frame buildings.

1. Describe wall framing systems.
2. Describe the effects of load transfer and material shrinkage on wall framing system design.
3. Describe wall and wall plate layout.
4. Describe the assembly and erection of interior and exterior walls.
5. Describe wall framing design considerations for other trades.
6. Construct wall framing systems.

C. Ceiling Framing ..... 8 Hours

Outcome: Install ceiling joists.

1. Describe the layout and installation of ceiling joists.
2. Interpret building code span tables to design ceiling joists.
3. Install ceiling joists.

D. Building Envelope ..... 8 Hours

Outcome: Apply the materials and procedures used to reduce heat transfer.

1. Describe the design concepts of building envelope systems.
2. Describe heat transfer through building components.
3. Describe insulation and sound reduction techniques.
4. Describe the function of air, vapour and weather barriers.
5. Describe energy efficient construction techniques.

SECTION TWO: ..... WOOD FRAME ROOFS ..... 60 HOURS

A. Roof Framing Systems ..... 40 Hours

Outcome: Construct wood frame roof systems.

1. Describe wood frame roof and cornice systems.
2. Perform calculations for roof framing components.

3. Use building codes to determine rafter dimensions and spacing.
4. Describe layout and assembly of gable, hip and intersecting roof systems.
5. Construct a wood frame roof system.

B. Engineered Truss Systems ..... 20 Hours

Outcome: Install an engineered truss system.

1. Describe engineered trusses.
2. Describe the loads and forces acting on engineered trusses.
3. Describe receiving, storage and handling of engineered trusses.
4. Describe methods of erecting and bracing engineered trusses.
5. Install an engineered truss system.

SECTION THREE: ..... INTERIOR AND EXTERIOR FINISHES ..... 43 HOURS

A. Windows and Doors ..... 18 Hours

Outcome: Install windows and doors.

1. Describe window types and their uses.
2. Describe door types and their uses.
3. Describe window and door hardware and accessories.
4. Describe window and door installation procedures.
5. Install windows and doors.

B. Exterior Finishes ..... 18 Hours

Outcome: Install exterior finishes.

1. Describe exterior finishes and their uses.
2. Describe the installation of exterior finishing components.
3. Install an exterior finish.

C. Residential Roof Coverings ..... 7 Hours

Outcome: Install residential roof coverings.

1. Describe the preparation required for residential roof coverings.
2. Describe residential roof coverings.
3. Install a residential roof covering.

SECTION FOUR: ..... WOOD STAIRS ..... 31 HOURS

A. Single and Multi-Flight Stairs ..... 31 Hours

Outcome: Construct single and multi-flight stairs.

1. Define stair terms.
2. Interpret building code requirements for stairs.

3. Perform stair calculations.
4. Construct a stair.

SECTION FIVE: ... LIGHT COMMERCIAL ESTIMATING AND DRAWING INTERPRETATION ..... 64 HOURS

A. Drawing Standards ..... 4 Hours

Outcome: Create orthographic views, sectional views and detail views for a shop project.

1. Describe line types used in orthographic drawings.
2. Demonstrate dimensioning methods and techniques.
3. Describe page layout and centering techniques.
4. Describe section and detail views and the use of material symbols.
5. Create orthographic views, sectional views and detail views for a shop project.

B. Drawing Interpretation ..... 16 Hours

Outcome: Interpret a set of residential and light commercial working drawings.

1. Explain the paper language used in reading a set of drawings.
2. Identify the information contained in the different views presented in a set of drawings.
3. Describe the steps used to navigate through a set of drawings.
4. Interpret residential and light commercial working drawings.
5. Interpret engineered floor joist and roof truss details on shop drawings.

C. Interpretation of Building Codes and Standards ..... 10 Hours

Outcome: Interpret building codes and standards as they apply to residential and commercial building construction.

1. Describe the process of locating information in building codes and related documentation.
2. Interpret information from building codes and standards.

D. Wall Framing Calculations ..... 9 Hours

Outcome: Produce a material takeoff for wood wall framing.

1. Calculate material quantities using given centre-to-centre spacing details.
2. Calculate the quantity of linear material required.
3. Calculate the quantity of studs required for exterior and interior walls.
4. Determine lintel size from door and window rough openings.
5. Calculate the amount of sheathing required for exterior walls.
6. Produce a material take-off for exterior and interior walls.

E. Ceiling Framing Calculations ..... 4 Hours

Outcome: Produce material takeoffs for framed ceilings.

1. Produce a ceiling framing material takeoff for a gable and hip roof.

F. **Roof Framing Calculations** ..... **10 Hours**

Outcome: ***Produce material take-offs for roof systems.***

1. Perform calculations using given centre-to-centre spacing details.
2. Calculate framing material required for gable, hip and intersecting roofs.
3. Calculate sheathing and roof covering material requirements.
4. Calculate materials required for truss roofs.

G. **Exterior and Interior Wall Finish Calculations** ..... **3 Hours**

Outcome: ***Produce material takeoffs for exterior and interior wall finish materials.***

1. Calculate interior wall finish materials.
2. Calculate cornice and rake finish materials.
3. Calculate exterior wall finish materials.
4. Produce a material take-off for interior and exterior wall finish materials.

H. **Straight and Multi-Flight Stair Calculations** ..... **8 Hours**

Outcome: ***Calculate the required dimensions for openings and stairs.***

1. Calculate the unit rise, unit run, finished opening and rough opening for straight-flight and multi-flight stairs.

THIRD PERIOD TECHNICAL TRAINING
CARPENTER TRADE
COURSE OUTLINE

UPON SUCCESSFUL COMPLETION OF THIS PROGRAM THE APPRENTICE SHOULD BE ABLE TO PERFORM THE FOLLOWING OUTCOMES AND OBJECTIVES.

SECTION ONE:.....CONCRETE AND BUILDING LAYOUT..... 42 HOURS

A. **Commercial and Industrial Construction Site Safety ..... 4 Hours**

Outcome: Apply safe work practices on commercial and industrial construction sites.

1. Identify commercial and industrial construction site safety hazards.
2. Apply safe work practices with hoisting and lifting equipment.

B. **Scaffolding ..... 9 Hours**

Outcome: Assemble scaffold systems.

1. Describe scaffold terms and components.
2. Describe requirements for use and erection of scaffolds.
3. Describe scaffold systems and erection procedures.
4. Assemble a scaffold system.

C. **Concrete Mix Design ..... 3 Hours**

Outcome: Describe the mix design of concrete.

1. Describe concrete use within the construction industry.
2. Describe concrete materials, design and testing.
3. Describe the functions of concrete additives and treatments.
4. Describe types of grouts and mortars.

D. **Transporting and Placement of Concrete ..... 2 Hours**

Outcome: Describe methods of transporting and placing concrete.

1. Describe the transporting, placing and consolidating of concrete.
2. Describe the forces acting on concrete forms before and after set.

E. **Finishing and Curing of Concrete..... 3 Hours**

Outcome: Describe concrete finishing, curing and toppings.

1. Describe concrete finishing tools.
2. Describe concrete finishing methods.
3. Describe concrete hardeners, toppings and sealers and their uses.
4. Describe special surface treatments and finishes.
5. Describe concrete curing procedures.

F. **Joints and Reinforcement for Concrete** ..... **2 Hours**

Outcome: ***Describe the purpose of concrete joints and reinforcement.***

1. Describe the uses of construction, control, isolation, and expansion joints.
2. Describe types and sizes of deformed bars and welded wire fabric.
3. Describe the placement of reinforcing for footings, beams, columns, slabs, walls, and stairs.

G. **Pre-Stressed and Precast Concrete** ..... **1 Hour**

Outcome: ***Describe pre-stressed, precast and tilt-up construction and erection procedures.***

1. Describe uses of pre-stressed concrete.
2. Describe precast concrete manufacturing and erection.
3. Describe tilt up construction methods.

H. **Survey Equipment** ..... **18 Hours**

Outcome: ***Use survey equipment for building layout.***

1. Interpret how land is legally described.
2. Describe equipment used for building layout operations.
3. Describe advanced survey equipment.
4. Describe survey operations and use of accessories.
5. Use survey equipment for building layout.

SECTION TWO: ..... **COMMERCIAL FORM WORK** ..... **64 HOURS**

A. **Piles, Footings and Grade Beams** ..... **4 Hours**

Outcome: ***Describe foundation types used in commercial and industrial construction.***

1. Describe types of piles, footings and grade beams for commercial and industrial construction.

B. **Wall and Column Forming** ..... **20 Hours**

Outcome: ***Construct concrete wall and column formwork.***

1. Describe the forces encountered during concrete placement in walls and columns.
2. Describe wall and column form systems.
3. Describe architectural concrete form systems.
4. Describe slip forms.
5. Construct wall and column forms.

C. **Suspended Concrete Slabs** ..... **20 Hours**

Outcome: ***Construct suspended slab formwork.***

1. Identify types of suspended concrete slab systems.
2. Describe stationary forming of suspended slabs.
3. Describe fly forming of suspended slabs.
4. Describe stripping and re-shoring procedures for suspended slabs.
5. Construct formwork for a suspended slab.

D. Concrete Stairs ..... 20 Hours

Outcome: Construct concrete stair formwork.

1. Describe concrete stair types.
2. Describe types of landings, handrails and guards.
3. Perform calculations for concrete stairs.
4. Describe layout, formwork and stripping of concrete stair forms.
5. Construct a concrete stair form.

SECTION THREE: ..... COMMERCIAL INTERIORS AND EXTERIORS ..... 64 HOURS

A. Interior Systems and Door Frames ..... 10 Hours

Outcome: Install interior metal fabricated products.

1. Describe the installation of metal studs.
2. Describe the installation of gypsum board.
3. Describe the installation of demountable partitions.
4. Describe the installation of suspended ceilings.
5. Describe setting and anchoring of metal frames.
6. Install metal non-load bearing wall systems.
7. Install metal door jambs.
8. Install suspended ceiling systems.

B. Commercial Doors and Windows ..... 10 Hours

Outcome: Install commercial doors and windows.

1. Describe commercial door and door hardware installation.
2. Describe commercial window rough opening preparations.
3. Install commercial doors and windows.

C. Commercial Exteriors ..... 4 Hours

Outcome: Describe types of commercial exteriors and the layout and construction of arch support templates used for masonry exteriors.

1. Identify types of commercial exteriors.
2. Describe layout and construction procedures for exterior architectural features.

D. Commercial Roofs ..... 2 Hours

Outcome: Prepare a commercial building roof for roofing installers.

1. Describe low slope roof systems.
2. Describe the carpenter's role in preparing commercial roofs for roofing application.

E. Fire Protection, Acoustics and Commercial Insulation ..... 4 Hours

Outcome: Install fire and sound rated assemblies, thermal insulations and sealants.

1. Describe the requirements and materials used for fire protection and separations installations.

2. Describe the requirements and materials used for sound-rated installations.
3. Describe the requirements and materials used for commercial insulation installation procedures.

F. Commercial Fasteners and Anchors ..... 2 Hours

Outcome: Install fasteners and anchors used in commercial construction.

1. Describe types of commercial fasteners, anchors, loads and tools.
2. Describe methods of fastening materials.

G. Timber Construction ..... 2 Hours

Outcome: Construct heavy timber buildings.

1. Describe heavy timber construction methods.
2. Describe glue laminated wood products and erection procedures.
3. Describe heavy truss and box beam construction.
4. Describe construction methods for Pole Buildings.
5. Describe construction of log buildings.

H. Commercial Interior Millwork ..... 30 Hours

Outcome: Construct commercial interior millwork.

1. Match wood grains and apply edge veneers and plywood.
2. Work with a variety of joints and solid woods.
3. Use clamps and glues.
4. Use contact adhesives.
5. Construct and install drawers, doors and shelves and sliding components.
6. Use jigs, templates and other accessories to increase the efficiency of power tools.
7. Cut, fit and apply plastic laminates or other wood substitutes.
8. Develop obtuse, acute and compound angles and incorporate them into a project.

SECTION FOUR: .....COMMERCIAL ESTIMATING AND DRAWING INTERPRETATION ..... 70 HOURS

A. Drawing Standards ..... 4 Hours

Outcome: Develop orthographic and pictorial drawings.

1. Describe orthographic and pictorial drawing basics.
2. Develop orthographic and pictorial drawings for a shop project.

B. Commercial Drawing Interpretation ..... 24 Hours

Outcome: Interpret a set of commercial drawings.

1. Describe commercial drawing interpretation practices.
2. Interpret a set of pole frame construction drawings.
3. Interpret a set of heavy timber construction drawings.
4. Interpret a set of reinforced concrete construction drawings.
5. Interpret a set of drawings for emerging technology commercial building systems.

C. **Commercial Concrete Structures Material Takeoffs** ..... **10 Hours**

Outcome: ***Develop material takeoffs for commercial concrete formwork.***

1. Perform calculations using different centre-to-centre spacings.
2. Calculate wall form sheathing requirements.
3. Calculate dimensional lumber requirements for formwork.
4. Calculate snap ties and wedges requirements for formwork.
5. Produce a formwork material takeoff.

D. **Commercial Concrete Volume Calculations** ..... **8 Hours**

Outcome: ***Develop a material takeoff for concrete volume requirements of various components of a commercial building.***

1. Calculate concrete volume requirements for various construction components.
2. Calculate concrete volume requirements for commercial building components.
3. Produce a commercial building concrete material takeoff.

E. **Cut and Fill Calculations** ..... **8 Hours**

Outcome: ***Calculate volumes for cut, fill and excavation requirements.***

1. Calculate the volume of excavation required to level or grade a site.
2. Calculate the volume of mass excavation required for a building.
3. Calculate the volume of backfill and excess haul required for a building.

F. **Concrete Stair Calculations** ..... **8 Hours**

Outcome: ***Calculate design dimensions and material requirements for concrete stairs.***

1. Perform calculations for a concrete stair design.
2. Calculate quantities of concrete required for concrete stairs.
3. Calculate material requirements for concrete stair forming.

G. **Interior Systems Calculations** ..... **8 Hours**

Outcome: ***Produce a material takeoff for an interior system in a commercial building.***

1. Calculate required metal studs and plate material.
2. Calculate required gypsum board and resilient channel.
3. Calculate required quantities of all components of a demountable partition system.
4. Calculate required quantities of grid components and tiles for a suspended ceiling system.
5. Produce a material takeoff for a commercial interior system.

FOURTH PERIOD TECHNICAL TRAINING
CARPENTER TRADE
COURSE OUTLINE

UPON SUCCESSFUL COMPLETION OF THIS PROGRAM THE APPRENTICE SHOULD BE ABLE TO PERFORM THE FOLLOWING OUTCOMES AND OBJECTIVES.

SECTION ONE:.....WORKPLACE ORGANIZATION AND INTERIOR FINISHES..... 69 HOURS

A. Industrial Construction Site Safety..... 3 Hours

Outcome: ***Apply Occupational Health and Safety Regulations and safe work practices on construction sites.***

1. Determine OH & S safety requirements for industrial construction site hazards.
2. Describe personal health hazards related to industrial construction sites.
3. Describe organizational roles within industrial construction projects and the levels of responsibility and reporting.

B. Alberta's Industry Network..... 2 Hours

Outcome: ***Describe the role of the Alberta Apprenticeship and Industry Training Board and the network of industry committees that represent the trades and occupations in Alberta.***

1. Describe Alberta's apprenticeship and industry training system.
2. Describe the roles and responsibilities of the Alberta Apprenticeship and Industry Training Board, government and post-secondary institutions.
3. Describe the roles and responsibilities of the PACs, LACs and occupational committees.

C. Workplace Coaching Skills..... 2 Hours

Outcome: ***Display coaching skills.***

1. Describe coaching skills used for training apprentices.

D. Interprovincial Standards Red Seal Program ..... 1 Hour

Outcome: ***Use Red Seal Products to challenge an Interprovincial examination.***

1. Identify Red Seal products used to develop Interprovincial examinations.
2. Use Red Seal products to prepare for an interprovincial examination.

E. Job Scheduling..... 4 Hours

Outcome: ***Use job scheduling methods.***

1. Describe job scheduling methods.
2. Identify computer software applications for job scheduling.
3. Create a job schedule.

F. Construction Materials Management ..... 4 Hours

Outcome: ***Manage construction materials.***

1. Describe procurement and delivery considerations.

2. Describe methods of construction material storage.
3. Describe methods of protecting completed projects from damage.
4. Draft a construction materials management plan.

G. Cabinet Installation ..... 4 Hours

Outcome: Install cabinets and storage units.

1. Describe pre-made and site-built cabinet installation.
2. Describe trim, accessories and hardware for cabinets.
3. Describe countertop installation.

H. Trim Installation ..... 4 Hours

Outcome: Install trim and finishing components.

1. Identify types of trim.
2. Describe trim installation methods.
3. Describe types of joints.
4. Install trim.

I. Walls and Storage ..... 2 Hours

Outcome: Install commercial interior wall finishes, shelving and storage systems.

1. Describe commercial interior wall finishes and installation procedures.
2. Describe shelving systems and installation procedures.
3. Describe storage systems and installation procedures.

J. Wood Finishing ..... 2 Hours

Outcome: Apply wood finishes.

1. Describe wood finishing products.
2. Describe surface preparation for wood finishes.
3. Describe methods of applying wood finishes.

K. Flooring ..... 2 Hours

Outcome: Install flooring materials.

1. Describe flooring materials.
2. Describe the preparation requirements for flooring materials.
3. Describe the installation of flooring materials.

L. Interior Finish Carpentry Project ..... 39 Hours

Outcome: Construct an interior finish carpentry project approved by the Carpenter Provincial Apprenticeship Committee.

1. Interpret a set of drawings for an interior finish carpentry project.
2. Create detail drawings for an interior finish carpentry project.
3. Identify materials, hardware and specifications for an interior finish carpentry project.

4. Produce a material cutting list for an interior finish carpentry project.
5. Cut and prepare materials for assembly.
6. Match wood grains and apply edge veneers, mouldings and plywood.
7. Work with a variety of joints and solid woods.
8. Use clamps and glues.
9. Use contact adhesives.
10. Construct and install drawer, door and shelves and sliding components.
11. Cut, fit and apply plastic laminates or other wood substitutes.
12. Construct an interior finish carpentry project.

SECTION TWO: ..... ADVANCED ROOF FRAMING AND STAIRS ..... 75 HOURS

A. Advanced Roof Framing ..... 20 Hours

Outcome: Frame unequal slope roofs, dormers, turrets and other roof features.

1. Describe framing for unequal slope roofs.
2. Perform unequal slope roof framing calculations and layout.
3. Describe framing for advanced roof features.
4. Perform advanced roof features framing calculations and layout.
5. Frame an unequal slope roof.
6. Frame advanced roof features.

B. Housed Stairs ..... 15 Hours

Outcome: Construct housed stairs and balustrades.

1. Describe the construction of housed stairs.
2. Describe the installation of balustrades.
3. Prepare jigs and templates for specified operations and full scale layouts.
4. Construct housed stairs and stair balustrades.

C. Winder Stairs ..... 20 Hours

Outcome: Construct winder stairs.

1. Describe winder stair components and building code requirements.
2. Perform calculations involving winder stairs.
3. Describe the layout and construction of winder stair landings.
4. Construct winder stairs.

D. Curved Stairs ..... 20 Hours

Outcome: Construct curved stairs.

1. Describe curved stairs and building code requirements.
2. Perform calculations involving curved stairs.
3. Describe the layout and construction of curved stairs.
4. Construct curved stairs.

SECTION THREE: ..... RENOVATIONS, BUILDING DESIGN, ENERGY EFFICIENCY AND BUILDING SCIENCE ..... 42 HOURS

A. Renovations ..... 4 Hours

Outcome: Describe renovations contracting, planning and renovation scheduling.

1. Identify the roles and responsibilities of a renovation contractor.
2. Produce a renovation schedule.
3. Describe problem-solving strategies for unforeseen challenges with renovation projects.

B. Additions ..... 2 Hours

Outcome: Construct building additions.

1. Describe building preparation considerations for additions.
2. Describe the sequence, scheduling and structural considerations for adding to the footprint of a building.
3. Describe design and load-bearing requirements when adding a storey to a building.

C. Architectural Building Design Concepts ..... 2 Hours

Outcome: Apply concepts of architectural design.

1. Describe concepts of design in architecture.
2. Describe the concept of function in architecture.

D. Barrier-Free Design and Ergonomics ..... 4 Hours

Outcome: Apply concepts of ergonomic and barrier-free design.

1. Describe standards of ergonomic design.
2. Describe barrier-free design principles.

E. Energy Efficient Construction ..... 6 Hours

Outcome: Apply current and emerging technologies in energy efficient construction.

1. Describe the evolution of Canadian energy efficient construction practices.
2. Describe energy rating and certification systems.
3. Describe the building sciences applicable to energy efficient construction.
4. Identify the economics of low-energy consumption buildings.

F. Energy Efficient Building Design ..... 6 Hours

Outcome: Use energy efficient design principles and equipment.

1. Identify energy efficiency factors affecting the design process.
2. Describe the principles of space conditioning.
3. Identify methods and equipment used to satisfy energy efficient heating, ventilation and air conditioning (HVAC) requirements.
4. Describe alternative energy sources and emerging technologies.

G. **Energy Efficient Framing** ..... **6 Hours**

Outcome: ***Use energy-efficient framing systems.***

1. Describe methods of constructing energy efficient wall and floor systems.
2. Describe methods of constructing energy efficient roof systems.

H. **Insulation and Air Barriers** ..... **12 Hours**

Outcome: ***Install insulation and air barrier systems.***

1. Describe insulation materials.
2. Describe insulation installation methods.
3. Describe materials and assembly methods for air barrier systems.

SECTION FOUR: .....INDUSTRIAL ESTIMATING AND DRAWING INTERPRETATION..... 54 HOURS

A. **Industrial Trade Math** ..... **6 Hours**

Outcome: ***Solve trade-related math problems.***

1. Perform trigonometric calculations.
2. Perform calculations for beam/column reactions.

B. **Interior Finish Calculations** ..... **4 Hours**

Outcome: ***Perform interior finish calculations.***

1. Perform interior finish calculations using different centre-to-centre spacings.
2. Perform calculations related to floor, ceiling and wall finishes.
3. Calculate material quantities for mouldings and trim.
4. Calculate material quantities for cabinets, countertops and hardware.
5. Produce a material takeoff and cutting list for interior finish components.

C. **Industrial Project Costing** ..... **3 Hours**

Outcome: ***Prepare an estimate for an industrial project.***

1. Describe a preliminary estimate for an industrial project.
2. Describe a detailed estimate.
3. Estimate material costs including waste factors.
4. Estimate labour costs.
5. Estimate overhead expenses.
6. Produce a summary sheet.
7. Prepare an estimate.

D. **Roof Calculations** ..... **6 Hours**

Outcome: ***Perform equal and unequal slope roof calculations.***

1. Calculate material quantities using different centre-to-centre spacings, slope gain factors and comparison of triangles.

2. Calculate line lengths of rafters for equal slope gable, hip and intersecting roofs.
3. Calculate line lengths of rafters for unequal slope gable, hip and intersecting roofs.

E. Advanced Stair Calculations ..... 5 Hours

Outcome: Perform stair and balustrade calculations.

1. Perform calculations for winder stairs.
2. Perform calculations for curved stairs.
3. Perform calculations for balusters and balustrades.

F. Industrial Drawing Interpretation ..... 30 Hours

Outcome: Interpret industrial drawings.

1. Interpret the information contained in the different views presented in a set of industrial project drawings.
2. Navigate through a set of industrial project drawings.

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